Expanding India's share in global space economy

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"ISRO should embrace a civilian identity and, aided by legislation, form partnerships with the industry and entrepreneurs."

From a modest beginning in the 1960s, India's space programme has grown steadily, achieving significant milestones. These include fabrication of satellites, space-launch vehicles, and a range of associated capabilities.

Today, the Indian Space Research Organisation (ISRO)'s annual budget has crossed Rs.10,000 crore ($1.45 billion), growing steadily from Rs.6,000 crore five years ago. However, demand for space-based services in India is far greater than what ISRO can supply. Private sector investment is critical, for which a suitable policy environment needs to be created. There is growing realisation that national legislation is needed to ensure overall growth of the space sector. The draft Space Activities Bill introduced in 2017 has lapsed and the government now has an opportunity to give priority to a new Bill that can be welcomed by the private sector, both the larger players and the start-ups alike.

ISRO's thrust areas

Since its establishment in 1969, ISRO has been guided by a set of mission and vision statements covering both the societal objectives and the thrust areas. The first area was of satellite communication, with INSAT and GSAT as the backbones, to address the national needs for telecommunication, broadcasting and broadband infrastructure.

Gradually, bigger satellites have been built carrying a larger array of transponders. About 200 transponders on Indian satellites provide services linked to areas like telecommunication, telemedicine, television, broadband, radio, disaster management and search and rescue services.

A second area of focus was earth observation and using space-based imagery for a slew of national demands, ranging from weather forecasting, disaster management and national resource mapping and planning.

These resources cover agriculture and watershed, land resource, and forestry managements. With higher resolution and precise positioning, Geographical Information Systems' applications today cover all aspects of rural and urban development and planning. Beginning with the Indian Remote Sensing (IRS) series in the 1980s, today the RISAT, Cartosat and Resourcesat series provide wide-field and multi-spectral high resolution data for land, ocean and atmospheric observations.

A third and more recent focus area is satellite-aided navigation. The GPS-aided GEO augmented navigation (GAGAN), a joint project between ISRO and Airports Authority of India, augmented the GPS coverage of the region, improving the accuracy and integrity, primarily for civil aviation applications and better air traffic management over Indian airspace. This was followed up with the Indian Regional Navigation Satellite System (IRNSS), a system based on seven satellites in geostationary and geosynchronous orbits.

It provides accurate positioning service, covering a region extending to 1,500 km beyond Indian borders, with an accuracy greater than 20 metres; higher accuracy positioning is available to the security agencies for their use. In 2016, the system was renamed NavIC (Navigation with Indian Constellation).

With growing confidence, ISRO has also started to undertake more ambitious space science and exploration

missions. The most notable of these have been the Chandrayaan and the Mangalyaan missions, with a manned space mission, Gaganyaan, planned for its first test flight in 2021. These missions are not just for technology demonstration but also for expanding the frontiers of knowledge in space sciences.

None of this would have been possible without mastering the launch-vehicle technology. Beginning with the Satellite Launch Vehicle (SLV) and the Augmented Satellite Launch Vehicle (ASLV), ISRO has developed and refined the Polar Satellite Launch Vehicle (PSLV) as its workhorse for placing satellites in low earth and sun synchronous orbits. With 46 successful missions, the PSLV has an enviable record. The Geosynchronous Satellite Launch Vehicle (GSLV) programme is still developing with its MkIII variant, having undertaken three missions, and is capable of carrying a 3.5 MT payload into a geostationary orbit. Compare this to the French Ariane 5, which has undertaken more than 100 launch missions and carries a 5 MT payload, with an Ariane 6 in the pipeline for 2020.

Over the years, ISRO built a strong association with the industry, particularly with Public Sector Undertakings (PSUs) like Hindustan Aeronautics Limited, Mishra Dhatu Nigam Limited and Bharat Electronics Limited and large private sector entities like Larsen and Toubro, Godrej and Walchandnagar Industries. However, most of the private sector players are Tier-2/Tier-3 vendors, providing components and services. The Assembly, Integration and Testing (AIT) role is restricted to ISRO, which set up Antrix, a private limited company, in 1992 as its commercial arm to market its products and services and interface with the private sector in transfer of technology partnerships.

Today, the value of the global space industry is estimated to be $350 billion and is likely to exceed $550 billion by 2025. Despite ISRO's impressive capabilities, India's share is estimated at $7 billion (just 2% of the global market) covering broadband and Direct-to-Home television (accounting for two-thirds of the share), satellite imagery and navigation. Already, over a third of transponders used for Indian services are leased from foreign satellites and this proportion will rise as the demand grows.

Developments in Artificial Intelligence (AI) and big data analytics has led to the emergence of 'New Space' — a disruptive dynamic based on using end-to-end efficiency concepts. A parallel is how the independent app developers, given access to the Android and Apple platforms, revolutionised smartphone usage. New Space entrepreneurship has emerged in India with about two dozen start-ups who are not enamoured of the traditional vendor/supplier model but see value in exploring end-to-end services in the Business-to-Business and Business-to-Consumer segments. However, these start-ups have yet to take off in the absence of regulatory clarity.

'New Space' start-ups

The New Space start-ups discern a synergy with government's flagship programmes like Digital India, Start-Up India, Skill India and schemes like Smart Cities Mission. They see a role as a data-app builder between the data seller (ISRO/Antrix) and the end user, taking advantage of the talent pool, innovation competence and technology know-how. They need an enabling ecosystem, a culture of accelerators, incubators, Venture Capitalists and mentors that exists in cities like Bengaluru which is where most New Space start-ups have mushroomed.

Equally, clear rules and regulations are essential. ISRO can learn from its 1997 SatCom policy which neither attracted any FDI in the sector nor a single licensee. A similar situation exists with the Remote Sensing Data Policy of 2001, amended in 2011, which too has failed to attract a single application. The 2017 draft Bill raised more questions because it sought to retain the dominant role of ISRO/Antrix as operator, licensor, rule-maker and service provider.

Another revolution under way is the small satellite revolution. Globally, 17,000 small satellites are expected to be launched between now and 2030. ISRO is developing a small satellite launch vehicle (SSLV) expected to be ready in 2019. It is a prime candidate, along with the proven PSLV, to be farmed out to the private sector. This requires giving it responsibility for AIT activities.

Years ago, ISRO launched the idea of Village Resource Centres to work in collaboration with local panchayats and NGOs but only 460 pilots have begun. Expanding this for rural areas is a formidable challenge but has the potential to transform rural India if properly conceived as a part of the India Stack and the Jan Dhan Yojana.

With the Ministry of Defence now setting up a Defence Space Agency and a Defence Space Research Organisation, ISRO should actively embrace an exclusively civilian identity. A new Space law for India should aim at facilitating growing India's share of global space economy to 10% within a decade which requires a new kind of partnership between ISRO, the established private sector and the New Space entrepreneurs.

GS World Team...

Chandrayaan-2

What's in the discussion?

- Recently ISRO has announced the date and time of launch of Chandrayaan-2.
- Chandrayaan-2 will be launched on July 15.
- According to ISRO, the GSLV Mark 3 rocket will set the orbiter in the polar orbit of the Earth in 15 minutes
- It is known that in Chandrayaan-2 there is not even a single foreign payload. All its parts are completely indigenous, while Chandrayaan-1's orbiter has 3 Europe and 2 US Payloads.
- ISRO has hoped that Chandrayaan-2 will land near the of the moon on 6th September. à Chandrayaan-II is the second moon mission and has three modules in Orbiter, Lander (Vikram) and Rover (Pragyan).
- India launched Chandrayaan-1 on October 22, 2008, after a decade later which of Chandrayaan-2 will be launched at a cost of 800 crores.

About mission

- **Orbiter:** Chandrayaan-2's orbiter will be installed at a distance of 100 km from the moon. It will send the information from Lander and Rover to the ISRO Center while circling.
- There are 8 payloads in it. It will also bring the GS World Team... command sent from ISRO to the lander and the rover. It was made by Hindustan Aeronautics Limited and handed to ISRO in 2015.
- **Lander (Vikram):** Lander named is named after ISRO's founder and father of Indian space program Vikram Sarabhai. There are 4 payloads in it.
- It will conduct scintific recearch for 15 days. Its initial design was made by ISRO's space application center Ahmedabad. Later it was developed by the URSC of Bengaluru.
- **Rover (Pragyan):** This is a robot and will be the responsibility of the whole mission will be on this conduct robot, weighing 27 kilograms. This robot has two payloads.
- It will cover a distance of 400 meters On the surface of the moon. During this, it will use various scientific experiments. Then send this information from the moon to Vikram Lander.
- Lander will send data to orbiter from there. Thenthe orbiter will send it to the ISRO center.
- This whole process will take about 15 minutes. Thatmeans the information sent from Pragyan Robot will take about 15 minutes to reach the ISRO center in India

Expected Questions (Prelims Exams)

1. Consider the following statements regarding Indian Space Research Organisation (ISRO)-

1. ISRO established its first space laboratory in India as Astrosat in 2015.
2. ISRO has been awarded Indira Gandhi Award in 2015 for peace, proliferation and development.

Which of the above statement is /are correct?

(a) Only 1 (b) Only 2

(c) Both 1 and 2 (d) Neither 1 nor 2

Expected Questions (Mains Exams)

Q. Discuss the main functioning areas of ISRO, along with it also explain how India's share in global space ecomony be expanded.

(250 Words))

Note: Answer of Prelims Expected Question given on 4 July. is 1(c).